

## New island records of *Eucalyptus alba sensu lato* for Damar and Romang, Lesser Sundas, Indonesia

Colin R. Trainor

School of Environmental and Life Sciences, Charles Darwin University,  
Darwin NT 0800, Australia. Email: halmahera@hotmail.com

### Abstract

*Eucalyptus alba sensu lato* is currently distributed through northern Australia and Papua New Guinea, as well as the Lesser Sunda islands of Indonesia and Timor-Leste. In the Lesser Sundas the distribution of *E. alba* is poorly-known, but it has been recorded from the central islands of Flores, Solor, Adonara, Lembata, Pantar, Alor, Atauro, Wetar and Timor. Here, I document the first *E. alba* records for two remote volcanic Lesser Sunda islands - Damar and Romang. I also note new *E. alba* records from the less isolated Lesser Sunda islands of Lirang, Leti and Moa. Further study of these populations is needed to clarify the relationships, taxonomic status and dispersal among members of the *E. alba* species complex.

The occurrence of eucalypts growing naturally outside Australia is relatively poorly known. About 15 species grow outside Australia, and four species are known from Wallacea. On Sulawesi, the dominant oceanic island in the Wallacean realm, *E. deglupta* is a tall forest species. In the Lesser Sundas, three *Eucalyptus* species are currently recognised. The Lesser Sundas comprises hundreds of oceanic islands in southern Wallacea (south of Sulawesi and Maluku) but is dominated by Lombok, Sumba and Sumbawa in the west and Flores, Alor, Timor, Wetar and the Tanimbar archipelago in the central and eastern parts (Figure 1). In the hills, *Eucalyptus urophylla* occurs locally on Flores through to Wetar and Timor. The Wetar form of *E. urophylla* was split into *E. wetarensis* (Pryor *et al.* 1995), but recent genetic work includes it within the *E. urophylla* complex (Payson *et al.* 2007). On Timor's highest peak, Mount Ramelau (2,963 m), *E. urophylla* was collected and described as a new species (Pryor *et al.* 1995). The third Lesser Sunda *Eucalyptus* species is *E. alba sensu lato*. This is typically a tree of drier lowland habitats where it displays a high degree of variability in growth form, leaf and fruit morphology. It can grow as a woodland tree of 3–15 m or up to a tree of 50 m tall (Martin & Cossalter 1976).

The taxonomy of the *E. alba* group both in Australia and Lesser Sunda Islands remains unclear and species recognition and identity have changed regularly (Blake 1953; Pryor *et al.* 1995; Slee *et al.* 2006). The current taxonomy of this group is largely based on the size of adult leaves, buds and fruit and needs further investigation, particularly by genetic comparison. Slee *et al.* (2006) note that in

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Australia, *E. alba* var. *alba*, *E. bigalerita*, *E. platyphylla* and *E. tintinnans* are all morphologically very similar and may be better treated as one variable taxon. However, they largely avoid discussing extra Australian variation. Interestingly, Indonesian taxonomists refer to Lesser Sunda populations of *E. alba* as *E. platyphylla* (Martin & Cossalter 1976). Samples of *E. alba sensu lato* from Timor with broad, deltoid leaves and large fruit would key out to *E. bigalerita* or *E. platyphylla* using Australian taxonomic keys, although they lack the orange bark of at least the former (I. Cowie pers. comm.). Blake (1953) included *E. platyphylla* and *E. tintinnans* in his concept of *E. alba* but recognised *E. bigalerita*. He gave Timor, Flores, Solor and southern New Guinea as the extra Australian distribution of *E. alba* based on specimens seen by him, and this is the broad distribution recognised in this note. From his discussion it is likely that the southern New Guinea material seen by him would currently be placed in *E. platyphylla* (I. Cowie pers. comm.).

The most comprehensive Lesser Sunda review of *Eucalyptus* was by Martin and Cossalter (1976). They described the distribution of *E. alba* as “most of the islands which lie between Bali and Wetar”, including Bali, while more recent information suggests that the western limit is the eastern tip of Flores about the active Lewotobi volcano (Trainor & Lesmana 2000). There are no records of *Eucalyptus* from Komodo, Sumbawa, Sumba or Lombok. Eucalypts are also absent from the continental island of Aru to the direct east of the Lesser Sundas (Hope & Aplin 2004), and from the extensive Tanimbar archipelago to the east of Damar (Monk *et al.* 1997). Payn *et al.* (2007) stated that *E. alba* co-occurs with *E. urophylla* on Timor, Wetar, Flores, Adonara, Lomblen (Lembata), Pantar and Alor, which is essentially the same set of islands mentioned by Martin and Cossalter (1976) (Figure 1). Martin and Cossalter (1976) stated that “the existence of *E. alba* is also probable on the islands to the east of Wetar, but as for the delimitation of the natural habitat of *E. urophylla* one here comes up against the lack of botanical knowledge of the region”. Incidentally, photos of an *E. alba* woodland on Atauro island (between Timor and Wetar) have been published (Trainor *et al.* 2007, p. 44) but there has been no specific survey for *Eucalyptus* in these islands.

This article describes the presence of *E. alba* on Damar and Romang islands. Both are part of the Inner Banda Arc, lying c. 640 km northwest of Darwin, Australia, 195 km and 85 km northeast of Timor, respectively (Figure 1). Geology on both is dominated by recent volcanics, with raised coralline limestone along the coasts and inland. No weather stations exist locally on Damar, but rainfall on Romang Island averages at least 2,518 mm/year. Damar is a relatively high rainfall island, but the coasts are dry (c. 1200–1600 mm/yr) and rainfall tends to increase with elevation (RePPPProT 1989). Approximately 75% (c.150 km<sup>2</sup>) of the island retains closed-canopy tropical forests (projective foliage cover >70%: Specht *et al.* 1974), including dry forest near the coast with many deciduous trees (to 12–20 m tall), grading into semi-evergreen and evergreen forest further inland (to 40 m tall), above c.60 m elevation (Trainor 2007).

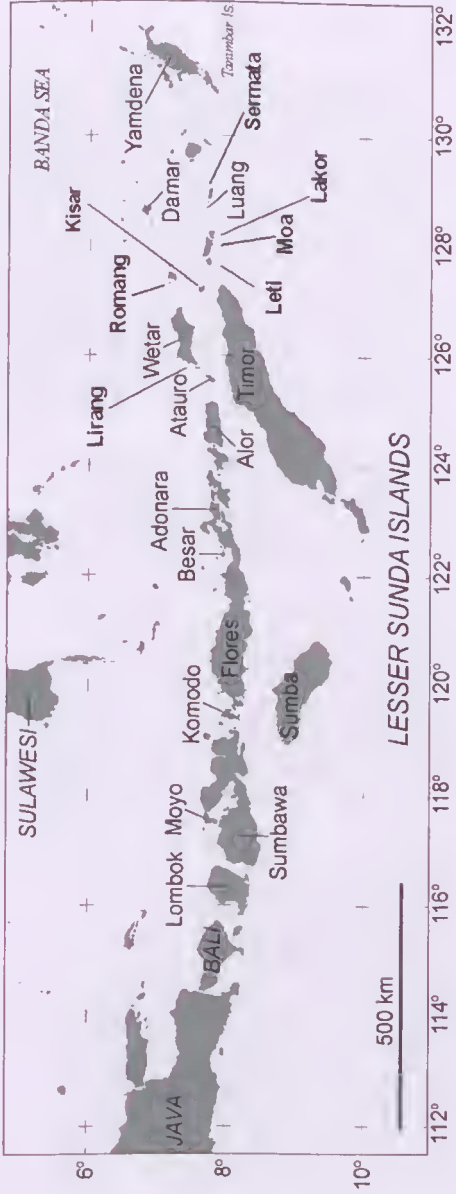


Figure 1. Location of Lesser Sunda islands mentioned in the text.

Forest is used for conversion to smallholder agricultural plots, timber collection and moderately intensive hunting of pigs, and birds (Trainor 2007). I also briefly mention the occurrence of *E. alba* for a further six Lesser Sunda islands (Lirang, Kisar, Leti, Moa, Lakor and Sermata: Figure 1). These islands are all less isolated from the potential *Eucalyptus* source islands of Timor and Wetar, but there has been no previously published information on the status of *E. alba* on them, as far as I am aware.

I visited Damar Island for about 4 hrs on 19 August 2008 while en-route to Wetar Island from Saumlaki, Tanimbar archipelago. Observations from a small “perintis” ship of a distinctive vegetation formation on ridges behind Wulur village (the main village on the island with about 300 houses) appeared to be of *Eucalyptus*, so I investigated further and took photos of trees, leaves and fruit. During a previous visit in 2001 (Trainor 2007), I walked about 100 km over 30 days throughout most of Damar except the south coast, visited two offshore islets, but did not observe any *Eucalyptus*. Romang Island was visited for 14 days during October 2010, primarily to observe birds, with briefer visits to Kisar (9 days), Leti (6 days), Moa (sailed past only in 2001 and 2010), Lakor (docked at harbour twice and sailed past the coast in 2010) and Sermata (8 days) in October–November 2010. I sailed past Lirang Island, 2.9 km southwest of Wetar, in 2001 and on 9 November 2008.

### *Damar Island*

On Damar, *E. alba* grew on ridges directly behind Wulur village (Figure 2), with trees starting at about 30 m elevation up to at least 300 m on quite steep slopes. The trunk was upright and smooth with a yellow-orange colour, and grew to about 12 m (Figure 3). The leaves appeared small (they were not measured); they were alternate and ovate, the fruit were obconic, disk annular, rims slightly exserted, valves 4, exserted (Figure 4). Within-island variation in *E. alba* morphology and growth form is substantial (e.g. on Timor: Martin & Cossalter 1976). Compared to closely related species in northern Australia such as *E. tintinnans* and *E. bigalerita* the bark appears paler (I. Cowie pers. comm.). The series of about 10 photographs from 2008 of the hills behind Wulur show many small patches – some continuous for hundreds of metres at least – of *E. alba* up to about 1 ha in extent on ridges and steep slopes. In stark contrast to the landscape patterning of *Eucalyptus* on neighbouring islands (e.g. Timor, Wetar, Alor, Pantar and Lembata) there appears to be a very indistinct boundary between the *E. alba* and surrounding vegetation, which appears (from photos) to comprise a tropical dry forest with a dense canopy cover (probably degraded through the high proximity to village).

No notes were made of the understorey beneath *E. alba*, but two photos show several tropical forest shrubs in full leaf during this mid-dry season period. The lack of a distinct *E. alba* – tropical forest boundary and presence of these shrubs, suggests that the *E. alba* woodland is being actively invaded by tropical forest. Fire regimes are an important factor in maintaining closed forest – *Eucalyptus* boundaries in tropical



**Figure 2.** Location of the readily visible patches of *Eucalyptus alba* woodland on steep ridges (indicated by arrows) above Wulur village, Damar island. The square shows the approximate location of the tree visited. The view is about 500 m wide and looks towards the southwest.

**Figure 3.** A *Eucalyptus alba* tree directly above Wulur village, Damar Island (about 50 m from the nearest house). Note yellow-orange trunk and the dense understorey of broadleaf shrubs and some weeds.





and other parts of Australia and may also be important in the Lesser Sundas. The lack of contrast with neighbouring tropical forest and indication that the *E. alba* woodland is being invaded by tropical forest makes it difficult to identify or discriminate the *E. alba* woodland from a distance, and therefore it is likely to be overlooked. Conceivably, there could be many square km of *E. alba* on Damar, but the photos show an area of at least 5–10 ha over about 1% of the available ridges on the island. The photos show small patches of swidden had been cut and burnt, which appears to have been done in both the tropical forest and also in the *E. alba* woodland. Apart from the swidden, there was no evidence of fire, though I did not enter the middle of *E. alba* patches.



**Figure 4.** Leaves and fruit of *E. alba* above Wulur, Damar Island.

### *Romang Island*

On Romang Island, *E. alba* grew on volcanic platforms above beach (Figure 5a), on ridges of moderate slopes similar to Damar (Figure 5b), and on inland plateaux in a complex mosaic with regenerating gardens and secondary forest. In this latter situation the small patches of *Eucalyptus* appeared to have not been converted to swidden agriculture because they occurred on rocky terrain (limestone) with heavy soils that are probably marginal for agriculture. Leaf shape of *E. alba* on Romang was ovate (Figure 6). *Eucalyptus* is not listed for Romang Island by one of the few reports on trees covering the Banda Sea islands (Hilderbrand 1951)

### *Other Islands*

The Outer Arc islands of Kisar, Leti, Moa, Lakor and Sermata are primarily low, dry limestone islands which provide a striking contrast to Damar and Romang. Kisar lies 25 km north of Timor and is dominated by lontar palm *Borassus flabellifer* savanna but *E. alba* was absent. On Leti, 38 km east of Timor, *E. alba* was a dominant tree in the lowlands (Figure 5), though is heavily used for firewood. On Moa, *E. alba* was visible

on a photo (slide) taken while sailing past the island in 2001 – but during the recent visit I travelled past the island at night only. The steep and dry slopes of Lirang Island, of the Inner Banda Arc, were dominated by *E. alba* with tropical forest in gullies and higher slopes above extensive mangroves (Figure 5d). No *Eucalyptus* was observed on the flat coralline island of Lakor (directly east of Moa), or on Sermata (a wetter limestone island).

Formerly, *E. alba* in the Lesser Sundas was known from eight islands, with a further five islands added here. Genetic diversity of *E. urophylla* was shown to decline from east towards the west which gave clues to the colonisation history of that tree



**Figure 5.** Island landscape views of *Eucalyptus alba*: (a) *E. alba* (to 10 m tall) in a typically narrow band backed by tropical forest above rocky volcanic cliffs on Romang; (b) Extensive patches of *E. alba* forest (to 25 m tall) on Romang with a grassy understorey on ridges and slopes, with adjacent slopes and gullies dominated by evergreen tropical forest – note dense canopy cover; (c) *E. alba* (to 15 m tall) dominates the steeper hills behind a village on Leti, with tropical forest in gullies and higher slopes, but much of the coastal strip has been converted to coconut plantation; (d) Sparse stands of *E. alba* (to 10 m tall) dominates the steep lower slopes and ridges on Lirang Island, late dry season.

in the Lesser Sundas (Payn *et al.* 2007). For *E. urophylla*, Payn *et al.* (2007) suggested that long distance island colonisation events were probably assisted by sea currents. An investigation of the genetics of both remote (Damar and Romang) and less remote island populations of *E. alba* might also provide interesting insights into the colonisation history and taxonomic status of this eucalypt on islands just off continental Australia.

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**Figure 6.** The ovate leaf form of *E. alba* on Romang island, with a White - shouldered Triller *Lalage sueurii* (Romang form), a common component of open habitats on the island.



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